

39. The method according to claim 31, in which the calculating of at least one of orbit and attitude of the space vehicle by means of a star catalog disregards those places in the image where the image of the rim of the earth is superimposed on the images of stars and thus eliminates disruptive influences on the precision of the tracking of the rim of the earth.

40. (New) The method according to claim 31, in which exposure or integration time of the sensor system is alternatingly adapted to a difference in brightness of the light from the star and the earth.

REMARKS

Careful consideration has been given to the Official Action of March 31, 2003 and reconsideration of the application as amended is respectfully requested.

Independent claims 18 and 31 have been amended to include the characterizing feature that the stars are evaluated using a star catalog. This was disclosed in original claim 6 and in claim 32. This feature is not disclosed in the cited art. With regard to the rejection set forth in the Official Action of September 12, 2002, the Examiner refers to column 3, line 17 of Falbel where Falbel is alleged to disclose a star catalog. This is not correct, however, as this portion of Falbel only refers to the use of initial ephemeris data for the star

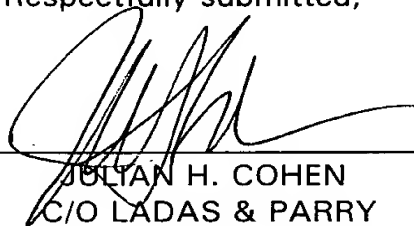
Polaris i.e. position data for one single star but not a star catalog. The use of a star catalog for the evaluation system of the sensor for star tracking is not disclosed nor suggested by Falbel or any of the other cited art.

As regards the objection raised by the Examiner concerning the use of numeral 8 on page 6, this is an error and the specification has been amended to correctly refer to the star window as window 6. No amendatory action is necessary in the drawings.

The Examiner has rejected claims 18-24 and 36 under 35 U.S.C. § 112 second paragraph on the grounds that it is unclear what the "means for variable control of exposure time ... based on the brightness of the earth and stars" consists of. The Examiner has noted a number of locations in the specification which refer to variable control of the exposure time but contends that the specification does not mention any structure or circuit which acts to variably control the exposure time. Such means or circuitry is inherently based in the image sensitivity system as is well known in the art, for example, in conventional cameras where a light sensor adjusts the aperture of the lens. This is so well known in the art that the disclosure which has been made will readily enable those skilled in the art to practice the invention without any further description or instruction.

On the basis of the above action and comments, it is respectfully submitted that the claims are now in allowable condition and favorable reconsideration is earnestly solicited.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Julian H. Cohen', is written over a horizontal line.

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Page 6, amend paragraph 2 as follows:

The aperture for earth observation is a small aperture which during observation of fainter stars preferably avoids interfering scattered light from the earth, and attenuates intensive sunlight which occurs at times when the sun appears in the beam path to the earth. The image of the earth through window 7 and the images of the stars through window [8] 6 are superimposed on the image pickup devices.

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18. (Twice Amended) A combined earth-star sensor system for three-axis attitude determination and orbit tracking of a satellite in space, said combined earth-star sensor system (1) comprising separate apertures with different directions of observation of earth and stars to receive light from the earth and stars, having respective levels of brightness and common image pickup devices (4) for the earth observation and the star observation, and an evaluation system for determining attitude and orbit of the satellite in which star tracking is achieved by means of a star catalog [including means for variable control of exposure time of earth and star observations by said common image pickup devices depending on the brightness of the earth and the stars being observed].

20. (Amended) The sensor system according to claim 18, comprising an optical arrangement (9) for star observation, an optical arrangement (10) for earth observation and a [semitranslucent] semitransparent beam splitter (8) between said apertures and the optical arrangements for deviating laterally entering light from the earth and transmitting light from the observed star, to the image pickup devices (4).

31. (Twice Amended) A method for simultaneous orbit determination and attitude determination of a space vehicle, comprising:
simultaneously forming images of a star and the rim of the earth in one

focal plane of a sensor system;

determining attitude of the star in said focal plane;

determining the rim of the earth by image processing;

determining rates of rotation of the sensor system from movement of the star image in the focal plane; and

calculating at least one of orbit and altitude of the space vehicle carrying the sensor system, wherein an evaluation system of the sensor system carries out star tracking by means of a star catalog.

[exposure or integration time of the sensor system is alternately adapted to a difference in brightness of the light from the star and the earth.]